Training Aid
for the
CBRN SCBA User's Guide

April 16, 2007

OD Review #04031

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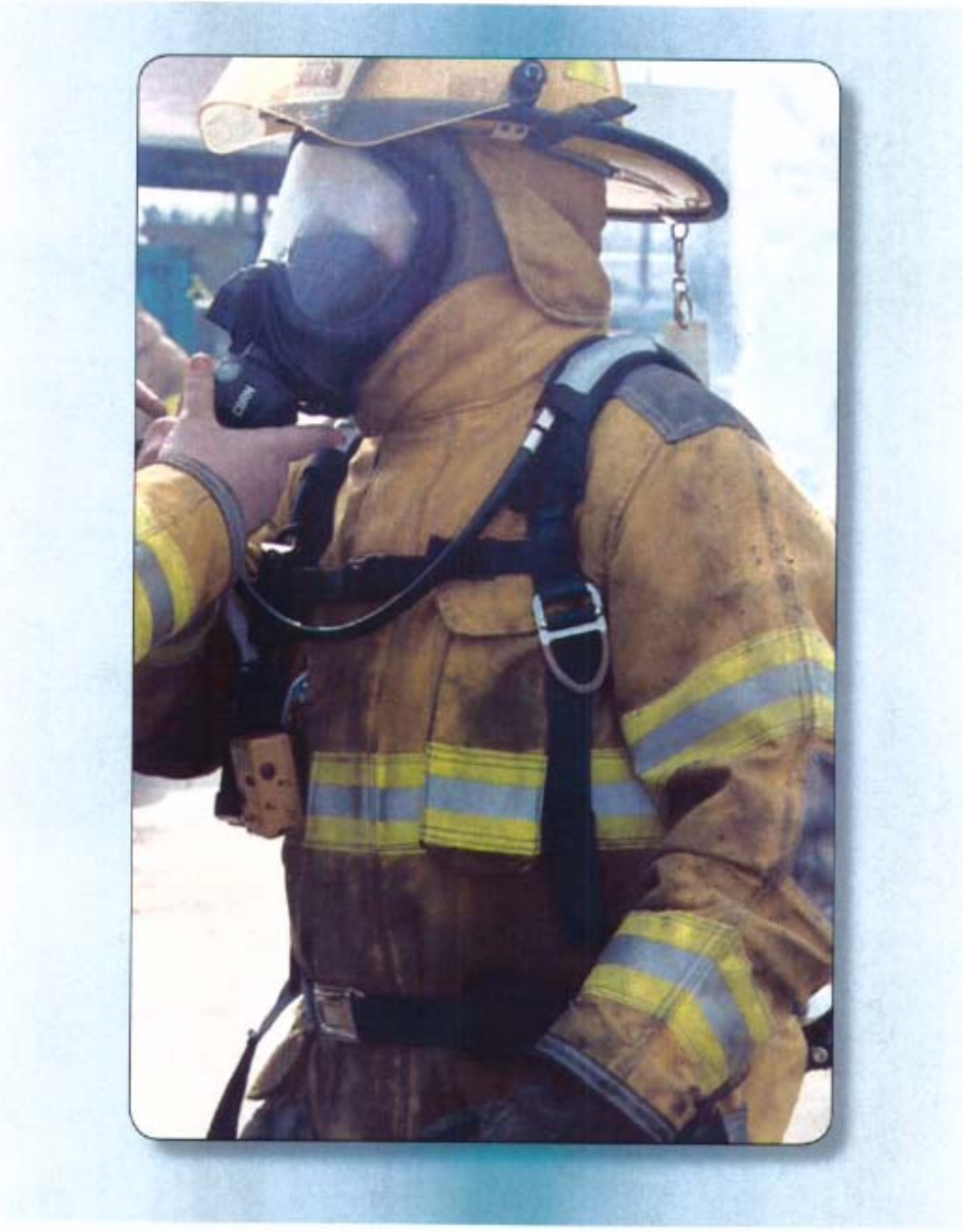
Front cover photography.

The front cover of this training guide depicts multiple workplaces in which a NIOSH-certified self-contained breathing apparatus (SCBA) with chemical, biological, radiological, and nuclear (CBRN) protection is currently used. From left to right: 1) Responders conducting CBRN terrorism crime scene analysis, 2) A municipal firefighter in turn-out gear preparing to go "on-air" and enter a flameover simulator, and 3) Municipal law enforcement special weapons and tactics (SWAT) officers in a staging area for a barricaded bioterrorism suspect apprehension.



Donning an SCBA and going on-air become routine tasks to a highly trained responder. The introduction of a new SCBA requires new equipment training and active two-man assistance to attain a proper protective posture. Here a firefighter goes on-air with the assistance of an ungloved hand docking his regulator. The firefighter is wearing a NIOSH-certified CBRN SCBA and full turnout gear in preparation for participation in a fire academy flame/flashover live fire training simulator field drill. Two PASS devices are visible: an integrated and a stand-alone. NIOSH photography is courtesy of an invitation to participate in training from the Director, Allegheny County Fire/Police Academy, Allison Park, PA, March 3, 2007. SCBA is a Mine Safety Appliances Company (MSA) respirator and contains the letters CBRN on the regulator.

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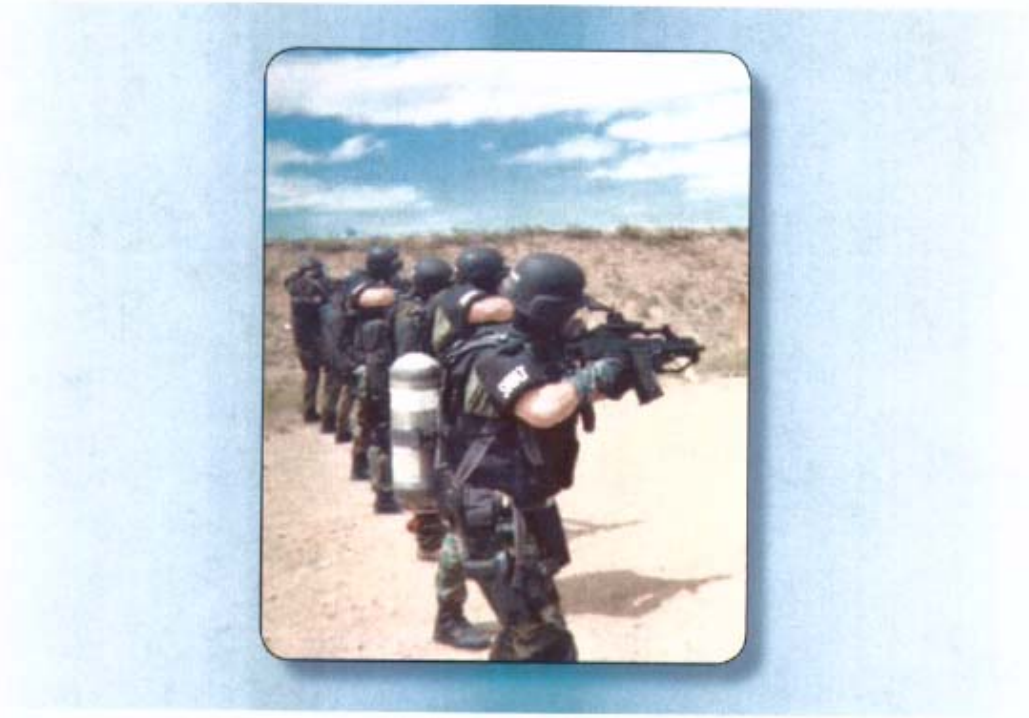
A responder conducting air monitoring and incident documentation actions in a CBRN training exercise. The responder is in a fully encapsulated OSHA/EPA Level A/NFPA 1994 Class 1 training ensemble and wearing a NIOSH-certified SCBA. The SCBA second stage regulator is just barely visible in the center of the translucent 40mil PVC window of the ensemble. Additionally, notice the expanded back area of the ensemble designed to protect the SCBA carried on the responder's back. This photograph was taken on May 7, 2005, during the City of Pittsburgh exercise response to a Sarin (GB) vehicle-improvised explosion devise (VB-IED) detonation in a sports venue.



Six law enforcement SWAT officers firing individual weapons at training targets while using standard tactical gear, NIOSH-certified SCBA, with and without CBRN protection, and mil spec protective gloves. Several unique user actions can be determined from this one photograph. A distinct cant of the weapon is necessary to attain a sufficient chin-to-stock hologram sight picture for the lead responder "on-air." Additionally, rip-stop sheathed SCBA cylinders, an unsheathed cylinder, an empty round casing discharging, and a tan-colored target silhouette are all visible.

Note: The photograph signifies a crawl-walk-run training program designed to acclimatize responders that traditionally have not been required to wear SCBA.

Photo was taken in 2005 during a National Tactical Officers Association (NTOA) SCBA course instruction for members of the Fort Collins Police Department, Pawnee Grasslands, Fort Collins, Colorado.

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Foreword

"Our greatest and gravest concern, however, is WMD in the hands of terrorists." *National Strategy for Combating Terrorism*, President George W. Bush, The Whitehouse, September, 2006.

The purpose of this Training Aid: CBRN SCBA User's Guide is to train responders and administrators in the best practices of recognizing and using NIOSH-certified self-contained breathing apparatus (SCBA) with chemical, biological, radiological, and nuclear (CBRN) protection. This training aid defines a 7-step process that leads the emergency responder through a concise sequence on how to recognize administrative labels that distinguish a NIOSH-certified SCBA with CBRN protections from a non-CBRN SCBA and then how to use a CBRN SCBA effectively. It assists the user in locating and understanding the specific NIOSH cautions and limitations related to the use of the CBRN SCBA. The step sequence also provides follow-on best practice recommendations on how to apply a new concept called CBRN respirator use life (CRUL), trains the user to recognize SCBA facepiece indicators of concern and the proper corrective actions. The training aid closes with recommendations for a CBRN SCBA decontamination plan and appendices that provide detailed component call-out diagrams of common CBRN SCBA and references.

Pre-event training with fit-tested and correctly sized personal protective equipment is key to a successful "all hazards" response. This CBRN SCBA training aid is a proactive measure to support realistic pre-event training of users in all levels of scenarios and real-world response. The durable training aid is designed for easy use, storage, and re-supply. As a bound paper or electronic PDF file, it can fit into an emergency responder's cargo pocket, be uploaded on a personal data accessory (PDA), or restructured for formal training use in a classroom.

When used in conjunction with an existing respiratory protection program, the training aid is expected to increase the efficacy of CBRN SCBA use during training and emergency events. Properly used, a NIOSH-certified CBRN SCBA protects emergency responders against all respiratory hazards associated with CBRN terrorism, as well as all traditional respiratory hazards created by fire, hazardous materials, illicit drugs, or natural disasters. The NIOSH respirator certification program in Pittsburgh, PA, and the national NIOSH approval holders sustain the inventory of available respirators and thereby, support homeland security preparedness and responder occupational safety and health.

Numerous models of SCBA with CBRN protections have been certified by NIOSH since the first approval was issued on May 31, 2002. Certifications of new types of CBRN SCBA and standards development for next generation CBRN respirators continue.

For more information about NIOSH-certified SCBA with CBRN protections and user guidelines, call 1-800-35-NIOSH or visit the website at:
http://www.cdc.gov/niosh/npptl/topics/respirators/cbrnapproved/scba/.

Director,
National Institute for Occupational Safety and Health

Director,
National Personal Protective Technology Laboratory

Acknowledgements

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Mr. Raymond V. DeMichiei of the City of Pittsburgh, Office of the Mayor, Bureau of Fire, Emergency Management Agency/Homeland Security, Mr. Stephen Hughes of the United States Capitol Police, Lt. Ed Allen of the Seminole County Sheriff's Office and the tactical SCBA instructors/users in the National Tactical Officer's Association (NTOA) are deeply appreciated for the invitations that allowed a NIOSH scientist to observe, train, advise, and photograph the respective responders using NIOSH-approved respirators.

A special thanks to Amanda Ford and Candace Wolf of EG&G Technical Services, Inc. for graphics and editorial support.

This photograph depicts a fire department ladder truck gross decontamination station and responders processing through its high-volume, low-pressure water spray, prior to continuing on to the technical decontamination stations during a local training exercise. Responders are in Level B ensembles and moving in a 360-degree circle, with extended arms, before leaving the spray. This photograph is a video still image made by Charles W. Urban, NIOSH Audiovisual Production Specialist, from a video taken in May 2005, City of Pittsburgh, PA.

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The photograph illustrates one of the earliest law enforcement uses of SCBA. It is a Sheriff's emergency response team participating in a training exercise during an "assault" on a barricaded CBRN hostage, April 22, 2001. Red smoke on the right simulates a weapons release. Note the handheld 4-gas detector in use by the third responder, the sheathed SCBA cylinders, the butyl hood shrouds interfacing with the gray Level C ensemble and the tactical boots worn over the suit footies. This photograph is courtesy of Scott Health and Safety and the Charlotte-Mecklenberg County Sheriff's Department, Charlotte, NC.

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How to Use this Training Aid

The training aid supplements an existing emergency services SCBA respirator training program, but does not replace one. Use this training aid to fine-tune your response capabilities focused on gaining maximum protection from existing SCBA and newly procured CBRN SCBA. The CBRN SCBA is not a "magic bullet" that will protect every trained user from being exposed to CBRN agents but it is a respirator designed to provide the highest level of respiratory protection, when coupled with existing dermal protective ensembles. NIOSH-certified SCBA with CBRN protection are deduced to be the best line of respiratory defense against terrorism or military grade chemical warfare agents in ambient or confined space environments. This conclusion is based on the generation of repeatable scientific data over the past five years from validated respirator certification programs originating and maintained to special CBRN performance standards performed by NIOSH laboratories and the U.S. Army Edgewood Chemical Biological Center (ECBC) live agent and corn-oil fit test facilities.

This training aid for the CBRN SCBA User's Guide is designed as an instructional guide to aid responders and administrators in identifying and using chemical, biological, radiological, and nuclear (CBRN) self-contained breathing apparatus (SCBA). The guide consists of a 7-step training sequence that should be followed sequentially in order to gain the maximum instructional value.

Throughout the training aid, yellow circles with black numbers are found on photographs and illustrations. These yellow circles indicate the location of labels that are required to be present on NIOSH-approved CBRN SCBA components or required to be in the user's instructions of the respirator. These black and yellow numbers also correspond to information in the text that describes in further detail the required adhesive or paper labels.

Steps 1-7 guide the reader through basic and complicated information that a responder would need to know to identify and use a NIOSH-approved CBRN SCBA. A trained user is recommended to read and implement the following steps contained in this training aid:

1) Locate the Labels

2) Verify the Labels

3) Know the Cautions and Limitations

4) Apply CRUL

5) Know the UI

6) Know Facepiece Indicators of Concern.

7) Implement Decontamination Methods

Appendix A-1 is a generic drawing of a color coded SCBA indicating five assemblies common to every CBRN SCBA.

Appendix A-2 is the same drawing but with a color code key and callout line arrows to the assemblies.

Appendix B is a sub-component call-out diagram identifying the names of common sub-components of those 5 primary assemblies. A Mask-Mounted Regulator that is non-detachable regulator is a significant difference.

Appendix C is a like sub-component drawing of a CBRN SCBA but for a mask-mounted regulator that is detachable. These represent the two most common types of regulators used by CBRN SCBA manufacturers.

Note: Where the official NIOSH Cautions and Limitations language appears in the text, it is shown in italics and the corresponding official letter indicators are in "quotations marks."

Appendicies A, B, and C provide detailed illustrations of a generic CBRN SCBA, a NIOSH-Certified CBRN SCBA, and standardized terminology for the various parts of an SCBA. In addition, there are blank note pages at the end of this guide for notetaking.

Acronyms

AHJ	authority having jurisdiction
BA	breathing apparatus
CBRN	chemical, biological, radiological, and nuclear
CRUL	CBRN respirator in-use life
CWA	chemical warfare agent
EOSTI	end-of-service-time indicator(s)
EPA	Environmental Protection Agency
GB	Sarin (chemical warfare agent - nerve)
HD	Sulfur mustard (chemical warfare agent - blister)
HUD	heads-up display
IDLH	immediately dangerous to life or health (concentration(s))
NFPA	National Fire Protection Association
NIOSH	National Institute for Occupational Safety and Health
OSHA	Occupational Safety and Health Administration
PASS	personal alert safety system
PPE	personal protective equipment
PSIG	pounds force of pressure per square inch gauge (excluding atmospheric pressure)
RIT	rapid intervention team
SCBA	self-contained breathing apparatus (open-circuit, pressure demand)
SEI	Safety Equipment Institute (private, non-profit certification organization)
UAC	universal air connection system
UI	user's instructions

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Glossary

air cylinder Department of Transportation regulated, pressurized vessel containing Type 1 gaseous air as defined in the ANSI/Compressed Gas Association (CGA) Commodity Specification for Air, G-7.1-2004, Edition 5.

air hose High or low pressure hose emanating from a regulated pressurized vessel/cylinders and designed to transfer breathable air from a regulated source to an engineered receptacle or facepiece regulator.

"All Clear" Verbal or digital command given by the ranking responder telling other responders that the existing toxic respiratory hazards are now determined to be below the OSHA PEL or below the incident commander's recommended exposure limit (REL) for a given contaminant or contaminants. User's go off-air and remove SCBA.

CBRN SCBA A description for a specific model of SCBA, indicating that an open circuit, pressure demand SCBA respirator has the type of NIOSH-approved chemical, biological, radiological, and nuclear protection currently available to emergency services.

Don SCBA To manually place a portable back pack respirator on a user and ensure all back frame and harness assembly mechanisms are adjusted and secure. A sized and fit tested facepiece is part of the respirator and is either on the face with the air switch/hatch open allowing the user to breathe ambient air or, if the regulator is detachable, the facepiece, with regulator attached, is in the ready position for the user to self-apply or apply with assistance from an expert fitter or a fellow responder. A time standard for donning the SCBA, with or without going on-air, is per the local AHJ..

Doff SCBA To remove a donned SCBA from the portable carrying position to a secure stable or transportable position whereby the SCBA is free of the user and with cylinder and facepiece intact.

Mayday, Mayday, Mayday! Vocal or digital emergency code word/command used intentionally as a distress signal in communications. It is used to signal a life-threatening emergency and is always given three times in a row to prevent mistaking it from similar sounding phrases or a separate message about a mayday call or relay.

Non-CBRN A description indicating that an open circuit, pressure-demand SCBA respirator **does not have** a type of NIOSH-approved chemical, biological, radiological, and nuclear protection, but may in fact, still be NFPA and/or NIOSH compliant to other standards, specifically non-CBRN respirator standards

Glossary (Continued)

"On-air"

The physical state of man-made protected active breathing for a user wearing a donned SCBA. This state consists of a user who has successfully donned an SCBA backframe and harness assembly and is actively breathing from the supplied air source. *Active breathing* for an SCBA involves several steps but primarily consists of activating/turning the SCBA cylinder valve to the fully open position, applying a fit tested facepiece with regulator to the user's face, and taking an initial inhalation breath to activate the pressure demand feature of the SCBA, followed by the conduct of a facepiece function/user seal check and then safely breathing continuously for the duration of the breathing air cylinder source, end of service life indicator activation, or cessation of the SCBA use mission, which ever comes first in a risk analysis

Being "On-Air" results in a specific level of respiratory protection provided to the user that is based on several factors such as the duration of the SCBA cylinder, user's breathing rate and level of physical fitness, NIOSH-approved level and type of protections, and other performance factors when a respirator is used in conjunction with the wearing of required/supplemental personal protective equipment appropriate to the hazard

Reseal Facepiece

Actions taken by a SCBA user to clear known or suspected contaminants from the breathing zone and then manually resealing the facepiece exterior faceblank surface to the user's unique facial features to attain a recognized face- to- facepiece seal either while the user is on-air, on by-passed air or breathing ambient air from a facepiece access port or air hatch. Resealing facepiece actions may involve self-donning or external expert fitting and the performance of a user seal check or functions check to determine the adequacy of the resealing facepiece donning techniques.

User seal check

A term used by OSHA and ANSI to indicate an action conducted by the respirator user to determine if the respirator is properly sealed to the face, without the SCBA regulator attached or with the ambient air hatch/switch in the open position.

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Step 1 Locate the Required Labels

There are four required labels:

NIOSH-certified chemical, biological, radiological, and nuclear self-contained breathing apparatus (CBRN SCBA) are required to have the following three adhesive labels displayed on the backframe of the respirator:

- Three adhesive Labels
- One paper insert label.

These should be easily located. First, find where they are located on the CBRN SCBA. Then, you must validate that they are, in fact, the correct serviceable labels!

How to locate the adhesive labels:

First, locate the backframe assembly of the SCBA.

If you need assistance, see NIOSH Appendix A, Component Assemblies of an SCBA.

On the front, rear, or both surfaces of the backframe, you should notice three adhesive labels. Note: The NIOSH adhesive labels are currently not authorized on the harness shoulder straps, waist belt, or any other pliable surface of the SCBA. Additionally, be knowledgeable of other types of labels, specifically maintenance performed labels, added by a local distributor or SCBA manufacturer.

Here is the descriptive text and issuance source of the labels required for CBRN compliance:

- NIOSH backframe and harness assembly label: Applied by the manufacturer for NIOSH
- NFPA 1981 label: Issued by the Safety Equipment Institute (SEI) for NFPA. The SEI certification label ensures compliance to the current edition or previous editions of the National Fire Protection Association (NFPA) 1981, Standard on Open-Circuit Self-Contained Breathing Apparatus for Emergency Services,
- NIOSH "CBRN Agent Approved" label: Applied by the manufacturer for NIOSH.

If you need photographic examples of what the labels look like, see the labels indicated by sequential numbers in yellow circles located in Figure 1, *Backframe with Locations of Three Adhesive Labels.*

You need to know that a minimum of the three required adhesive labels must be affixed anywhere on the backframe assembly of the CBRN SCBA. As for why is that NIOSH label so large or small or hard to read? Dimensions of the NIOSH labels are purposedly not design restrictive, for example, to allow the SCBA manufacturer the latitude of placing the labels on any suitable surface without retooling a mold. As for the lettering font size: NIOSH requires the words to be visible and easily read while the NFPA 1981 standard specifies font sizes, specific to the NFPA compliance label only.

Now that you have located the three adhesive labels for SCBA compliance to NIOSH-Special CBRN standards, you need to locate one more label---the paper approval label.

It is a Required Paper Matrix-Style Approval Label located in the SCBA manufacturer's user's instructions, also known as operations manual etc. If you need a photographic example of this label, see Figure 2, NIOSH paper matrix-style approval label.

Step 1 Locate the Required Labels (Continued)

You may wonder why you need this piece of paper! And better yet, if you have not done so already, as a user, you should ask for/retrieve all of the many pieces of paper that are issued with new SCBA or upgraded SCBA, determine the appropriate use of each critical document and make a master reference file or locate a reading file for individual use of each model of CBRN SCBA.

That paper label is a component listing of every "part"/respirator component, the manufacturer has designed to ensure the SCBA, as a system, meets manufacturer specifications to existing NIOSH, NFPA or equivalent respirator performance standards. Without that paper label, you do not have legal proof that every listed and on-hand part of the SCBA is approved to the stated type or level of NIOSH protection .

With the adhesive labels, you have proof that the SCBA, as a respirator system, is approved and with the paper label, you have total proof of part number certification supporting each respirator listed on the label. Without this paper label, you would have to defer to the NIOSH website standardized equipment list (SEL), the original NIOSH letter of approval to the manufacturer, or the Technical Certification (TC) approval number issued to the respirator to ensure the respirator configuration of part numbers you have on-hand is NIOSH-approved for entry into or egress from a CBRN respiratory incident.

NOTE: The NIOSH TC-approval number with CBRN designator is only on the NIOSH paper label and not on any of the adhesive backframe labels.

That was a short session on the labels. Now that you have located them, it is in your best interest to verify that they are what you thought or were told they were.

Figure 1. Backframe with locations of three adhesive labels: 1) NIOSH backframe & harness label, 2) SEI certification label and 3) NIOSH "CBRN Agent Approved" label. The photograph is one of Interspiro Inc.'s CBRN SCBA backframes approved to the NFPA 1981, standard, 1997 edition.

Step 1 LOCATE THE REQUIRED LABELS (CONTINUED)

4

OPEN-CIRCUIT, PRESSURE DEMAND, CBRN, COMPRESSED AIR, SELF-CONTAINED BREATHING APPARATUS

NIOSH National Institute for Occupational Safety and Health

THESE RESPIRATORS ARE APPROVED ONLY IN THE FOLLOWING CONFIGURATIONS

		RESPIRATOR COMPONENTS																																													
TC	PROTECTION	ALTERNATE FACEPIECE									ALTERNATE ANTI-FOG SOLUTION			ALTERNATE 1ST STAGE REGULATOR		2ND STAGE REGULATOR	BACKPACK	ALTERNATE GAUGE / ALARM		ALTERNATE CYLINDER AND VALVE ASSEMBLY							ALTERNATE INTERMEDIATE PRESSURE HOSE		GAUGE HOSE	ACCESORIES																	CAUTIONS AND LIMITATIONS
		242048	242016	242017	242050	242026	242027	242052	242036	242037	951015	951016	961805	968831	968832	969163	965800	980641	968888	917411	917409	917413	917405	917425	917427	917429	969168	969169	969829	962260	962600	962700	962869	968670	941258	941259	941261	965110	965119	963820	962600H	948940	948948	948945	962049	964869	
13F-284CBRN	SC/PD/CBRN 30 / min /4500 psig	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X			X	X			X	X	X	X	X	X	X	X	X			X	X	X	X	X			X	X	IJMNOSQRTU
13F-286CBRN	SC/PD/CBRN 45 / min /4500 psig	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X			X		X	X	X	X	X	X	X	X		X		X	X	X	X		X		X	X	IJMNOSQRTU
13F-287CBRN	SC/PD/CBRN 60 / min /4500 psig	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X							X	X	X	X	X	X	X	X	X			X	X	X	X	X			X	X	X	IJMNOSQRTU

1. PROTECTION

SC Self-contained
PD Pressure-demand
CBRN Chemical, biological, radiological and nuclear

CDC NIOSH
CBRN Agent Approved
See Instructions for Required Component Part Numbers, Accessories, and Additional Cautions and Limitations of Use

2. CAUTIONS AND LIMITATIONS

I Contains electrical parts which have not been evaluated as an ignition source in flammable or explosive atmosphere by MSHA/NIOSH.

J Failure to properly use and maintain this product could result in injury or death.

M All approved respirators shall be selected, fitted, used, and maintained in accordance with MSHA, OSHA, and other applicable regulations.

N Never substitute, modify, add, or omit parts. Use only exact replacement parts in the configuration specified by the manufacturer.

O Refer to user's instructions, and/or maintenance manuals for information on use and maintenance of these respirators.

S Special or critical user's instructions and/or specific use limitations apply. Refer to user's instructions before donning.

3. CAUTIONS AND LIMITATIONS: CBRN

Q Use in conjunction with personal protective ensembles that provide appropriate levels of protection against dermal hazards.

R Some CBRN agents may not present immediate effects from exposure, but can result in delayed impairment, illness, or death.

T Direct contact with CBRN agents requires proper handling of the SCBA after each use and between multiple entries during the same use. Decontamination and disposal procedures must be followed. If contaminated with liquid chemical warfare agents, dispose of the SCBA after decontamination.

U The respirator should not be used beyond 6 hours after initial exposure to chemical warfare agents to avoid possibility of agent permeation.

Figure 2. NIOSH paper matrix-style approval label 4.

Step 2 Verify Backframe and Harness Assembly Label

Backframe Harness Assembly Label (1)

Why is this label on the CBRN SCBA? This label confirms that the SCBA has met the first tier of the three tiers for CBRN certification. That first tier is commonly known in NIOSH language as the industrial approval tier or, more formally, as the TC-13F approval process for an industrial SCBA. This industrial label is unique in that it is the only label that contains the official federal Department of Health and Human Services (DHHS) logo and the official NIOSH logo together. Other required information is the resipirator manufacturer company name, address, phone number and a complete technical description of the respirator. Under this administrative information is a technical table followed by letter coded sentences. The technical table is required to list the following information from left to right and each line is independent of the one that follows it:

- NIOSH TC-13F- approval numbers
- Product names of the SCBA, as marketed by the manufacturer
- Time duration of the cylinder, as tested by NIOSH
- Working pressure of the SCBA, as rated by the U.S. Department of Transportation (DOT) and reviewed by NIOSH.

The label also contains language that tells the user to "Refer to the approved user instruction manual for the complete list of subassembly component parts that make up the approved assembly." This sentence is telling the user to find the paper matrix style label from NIOSH that carries the original approved NIOSH Cautions and Limitations letter codes and sentences granted to the respirator when it was designed by the manufacturer and approved by NIOSH to be used in industrial work settings, hence the name "industrial approval". If an example of what the label looks like is needed, see Figure 3, SCBA backframe label and Figure 4, Horizontal SCBA backframe label.

Without this traditional industrial label, the first tier of CBRN approval is not verified.

If this label is unreadable or deformed, consult the manufacturer.

Older versions of this industrial label are usually metal plates attached to the backframe of the SCBA. They carry the MHSA and NIOSH logos. If you would like to see an example of the NIOSH metal plate label, see Figure 5, *Backframe with MSHA-NIOSH Label dated, November 29, 1977.*

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Step 2 Verify Backframe and Harness Assembly Label (Continued)

Figure 5 is an actual SCBA backframe being used in a workplace, as of February 3, 2007. Notice the metal plate is held in place by four metal locking screws. An SCBA such as this is a red flag indicator for a CBRN responder. The user should know that the metal plate, without a supporting upgrade NFPA label, indicates that the SCBA is not NFPA compliant primarily because at that time the NFPA 1981 standard was most likely not in existence. As a user, if this type of label/SCBA is in your workplace and you use the SCBA for firefighting, ensure you locate the upgrade label that brought this SCBA into NFPA 1981 compliance.

Now, related to CBRN incident response, DO NOT USE THIS TYPE OF SCBA (with a backframe carrying a MHSA-NIOSH logo metal plate label) FOR ANY CIVILIAN EMERGENCY RESPONSE INVOLVING UNKNOWN CONCENTRATIONS OF CBRN CONTAMINANTS. Ensure you have it evaluated, tested, and approved by the manufacturer, NIOSH, or a federal equivalent agency, for performance compliance to existing NFPA and federal CBRN agent protection requirements.

Figure 5, Backframe with MSHA-NIOSH Label, dated November 29, 1977. Image recorded by NIOSH, February 3, 2007, from a courtesy course invitation of the Allegheny County Police/Fire Academy, Allison Park, PA.

Step 2 Verify Backframe and Harness Assembly Label (Continued)

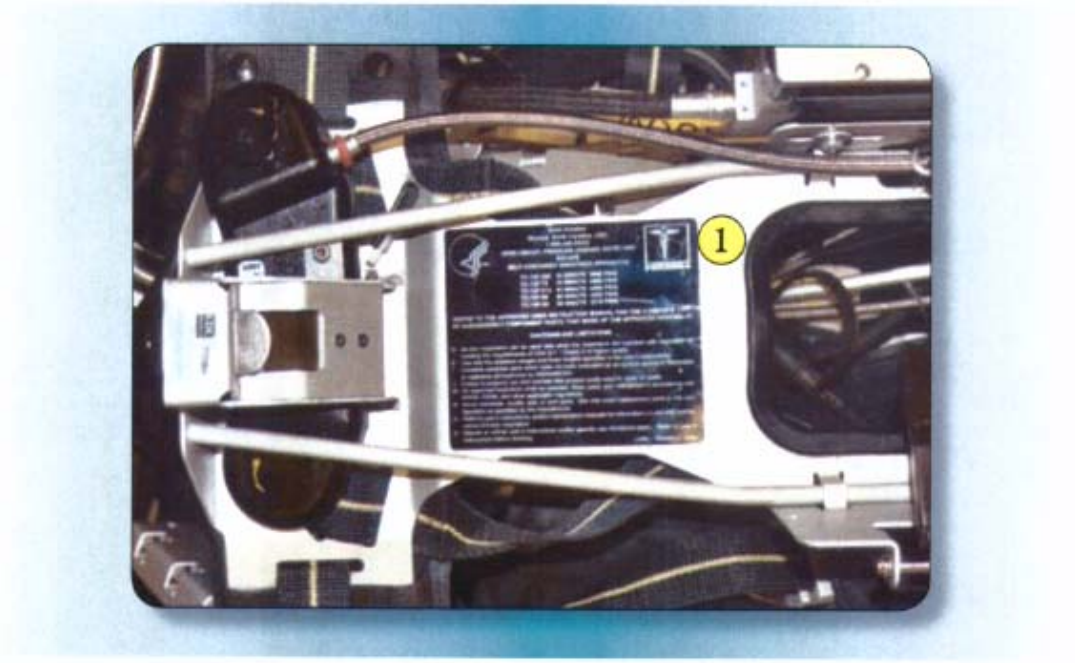

Figure 4. Horizontal SCBA backframe label. Actual SCBA backframe and harness assembly showing one of many variations on the size and location of a NIOSH backframe label. Image recorded in January, 2006, by NIOSH, courtesy of the United States Capitol Police (USCP), Cheltingham, MD. Respirator design is from Tyco/Scott Health and Safety.

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OPEN-CIRCUIT, PRESSURE DEMAND, ENTRY AND ESCAPE
SELF-CONTAINED BREATHING APPARATUS OR
COMBINATION SELF-CONTAINED BREATHING APPARATUS
AND SUPPLIED AIR RESPIRATOR

NIOSH

TC-13F-132	SPIROMATIC/SPIROLITE 4515	30 MINUTE	2216 P.S.I.G.
TC-13F-133	SPIROMATIC/SPIROLITE 4530	30 MINUTE	4500 P.S.I.G.
TC-13F-213	SPIROMATIC/SPIROLITE 6630	45 MINUTE	4500 P.S.I.G.
TC-13F-197	SPIROMATIC/SPIROLITE 9030	60 MINUTE	4500 P.S.I.G.
TC-13F-199	SPIROMATIC/SPIROLITE 9030 W/SUIT VENTILATION	60 MINUTE	4500 P.S.I.G.

CAUTIONS AND LIMITATIONS:
(REFER TO THE APPROVED USER INSTRUCTION MANUAL FOR THE COMPLETE LIST OF SUBASSEMBLY COMPONENT PARTS THAT MAKE UP THE APPROVED ASSEMBLY)

D- Air-line respirators can be used only when the respirators are supplied with respirable air meeting the requirements of CGA G-7.1 Grade D or higher quality.
E- Use only the pressure ranges and hose lengths specified in the user's instructions.
I- Contains electrical parts which have not been evaluated as an ignition source in flammable or explosive atmosphere by MSHA/NIOSH.
L- Failure to properly use and maintain this product could result in injury or death.
M- All approved respirators shall be selected, fitted, used, and maintained in accordance with MSHA, OSHA, and other applicable regulations.
N- Never substitute, modify, add, or omit parts. Use only exact replacement parts in the configuration as specified by the manufacturer.
O- Refer to users instructions, and/or maintenance manuals for information on use and maintenance of these respirators.
S- Special or critical users instructions and/or specific use limitations apply. Refer to instruction manual before donning.

Figure 3. SCBA backframe label. It is an enlarged NIOSH replica of the Interspiro Inc. label in Figure 1.

Step 2 VERIFY SEI CERTIFICATION LABEL

How do you determine a CBRN SCBA is safe to use in firefighting? Verify the SEI Certification Label for compliance to the NFPA 1981 Standard (2)

Read the label that calls out compliance to the NFPA 1981 standard, 1997 edition or later. It should look like Figure 5, *SEI Certification Label*

Ensure you know what edition of the NFPA standard with which the SCBA is compliant. NIOSH issued the first CBRN SCBA approval under the 1997 edition of the NFPA 1981 standard.

***Note:** "1981" refers to the number identifying the specific standard; it does not refer to a calendar year.

Impact of NFPA SEI Certification on NIOSH CBRN Approvals

The first NIOSH-certified SCBA with CBRN protection was certified to the 1997 edition of the NFPA 1981 Standard. Subsequently, the 2002 edition of the standard applies to numerous CBRN SCBA . The 2007 edition of the NFPA 1981 standard has been published and it mandates each new SCBA made to the specifications of the 2007 edition of the NFPA 1981 standard be NIOSH-certified with CBRN protection.

Without the SEI certification for NFPA 1981compliance label, the second tier of NIOSH CBRN protections is not verified.

Note: Interested users should refer to the NIOSH *Letter to All Respirator Manufacturers*, dated December 8, 2006, for specifics on the joint NIOSH/NPPTL and NFPA CBRN SCBA approval process for NFPA 1981, 2007 edition, respirator approvals.

Recognizing the SEI Certification Label

The SEI label can be any color, but must be a font size specified by the NFPA. The label must be readable, affixed to the SCBA with no evidence of destruction, and state appropriate NFPA language. Recognize this label and when it is present, know that the CBRN SCBA, as a respirator system, has met the voluntary requirements of applicable NFPA standards. Locate and verify a label that is identical or similar to Figure 5, *SEI Certification Label*. If you need an actual example for reference, see Figure 6, Red *SEI Certification Label*.

Step 2 Verify SEI Certification Label (Continued)

Figure 5. SEI certification label, Image recorded by NIOSH; this is an enlarged exact replica of the Interspiro, Inc. label in Figure 1.

Figure 6. Red SEI certification label. CBRN SCBA backframe and harness assembly showing horizontal red SEI certification label. Notice a partial black backframe label can be seen at the top of the photograph An administrative number of "182," assigned by the municipality, appears on the yellow sticker. Photograph was taken upon invitation from Steve Hughes, United States Capitol Police (USCP), SCBA staging site, January, 2006. Respirator design is courtesy of Tyco/Scott Health & Safety.

Step 2 Verify CBRN Agent Approved Label (Continued)

NIOSH CBRN Agent Approved and (Retrofit) Labels (3)

This next step is a little more complicated. It is important to know if your CBRN SCBA is a new CBRN SCBA or an upgraded SCBA with CBRN Protection awarded (Retrofit).

Both approvals are certified by the manufacturer to NIOSH CBRN SCBA standards, but in the upgraded model only the upgraded parts have been actually live agent tested and then applied by a certified technician to the SCBA.

Both types of SCBA are required to have a "CBRN Agent Approved" label, with the upgrade having a slight variation in the label language. Let's look at this a little closer!

Original CBRN Agent Approved Label:

A new-never-used CBRN SCBA will carry all previous labels (NIOSH industrial and NFPA 1981) and a new label on the SCBA backframe that signifies the SCBA is a new CBRN SCBA.

The new label is identified in Figure 7, Original CDC-NIOSH "CBRN Agent Approved" adhesive label.

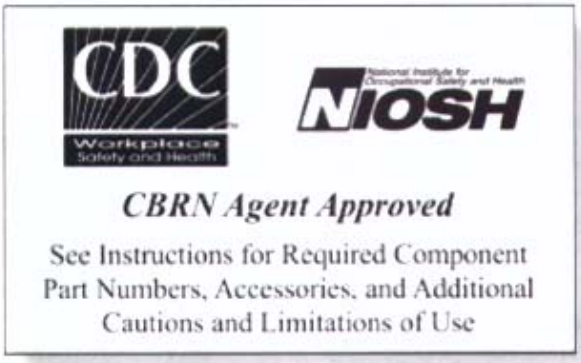

Figure 7, Original SCBA CDC-NIOSH CBRN Agent Approved Label,

Original "Retrofit" CBRN Agent Approved Label:

Whereas, a field deployed SCBA that has been upgraded to NIOSH CBRN protection will state the same "CBRN Agent Approved" language on an identical label but this label will be different because it will have the word RETROFIT in parenthesis under the language (Retrofit).

Upgrading or retrofitting is done by use of a NIOSH-approved retrofit kit that has been installed in accordance with the manufacturer's instructions by a certified technician or installed directly by the manufacturer.

The standard NIOSH logo and additional instructions are required to be present and readable. The upgrade/retrofit label is identified in Figure 8, Original CDC-NIOSH "CBRN Agent Approved" (Retrofit) label.

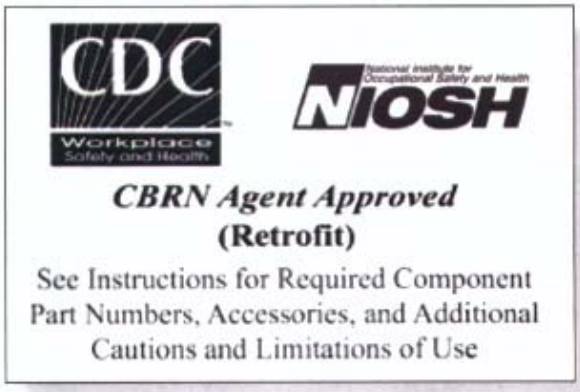

Figure 8. Original SCBA CDC-NIOSH CBRN Agent Approved (Retrofit) label.

Step 2 Verify CBRN Agent Approved Label (Continued)

Administrative Labeling that Voids NIOSH CBRN Approval on a SCBA:

- 1. If the label is scratched beyond recognition or fully or partially unreadable
- 2. If there are more than two styles of each or all labels present.
- 3. If one type or style of label is missing from the known CBRN SCBA
- 4. If there is an alteration to the label in any way such as a resin label or unique label applied over top of the NIOSH label making it different in readability.
- 5. CBRN Agent Approved (Retrofit) labels are found on new CBRN SCBA.
- 6. CBRN Agent Approved labels without the (Retrofit) language are found on field deployed SCBA.
- 7. Obvious label removal and replacement or discarding of required labels.

One of the two CBRN Agent Approved or CBRN Agent Approved (Retrofit) labels are required NIOSH adhesive labels and must be present on the backframe to signify that the SCBA has CBRN protection. Only **one** type of NIOSH "CBRN Agent Approved" label can be attached to the back-frame of the CBRN SCBA. If you see two or more CBRN agent approved labels on the same issued SCBA, consult with your SCBA technician for clarification. If the labels do not look exactly like the images in this guidance document, consult with your manufacturer representative or call NIOSH

Figure 9. Updated SCBA NIOSH CBRN Agent Approved label, effective Decemeber 5, 2005.

All NIOSH CBRN Agent Approved Labels are white background with black letter font. As the NIOSH certification program progressed from 2002 on, there became a need to differentiate between the types of logos used to signify the CBRN label. Consequently, in addition to the fact that there are new and retrofit performance requirements requested by users and manufacturers, and thus two styles of labels, there are also distinctions in the types of logos present. Original labels carry the CDC and NIOSH logos while the current CBRN agent approved labels only carry the NIOSH logo:

- Original SCBA "CBRN Agent Approved" Label (CDC and NIOSH logos)
- Original SCBA "CBRN Agent Approved" (Retrofit) Label (CDC and NIOSH logos)
- Updated SCBA "CBRN Agent Approved" Label (NIOSH logo only, after December 5, 2005)
- Updated SCBA "CBRN Agent Approved" Retrofit) Label (NIOSH logo only, after December 5, 2005)

Figure 10. Updated SCBA NIOSH CBRN Agent Approved (Retrofit) Label, effective December 5, 2005.

Step 2 Verify the Paper Matrix-Style Approval Label

The previous adhesive labels are essentially abbreviated required labels for ease of marking a CBRN SCBA

The official user label is the *Paper Matrix-Style Approval Label and it can be used to confirm part numbers, respirator system TC-approval numbers, or type/level of protection for a respirator, at the user level.*

As a user you may not even recognize this paper label. It is an abbreviation of the official quality assurance data matrix that is used to manage all the part numbers that can make up a type of SCBA or CBRN SCBA.

PRACTICAL APPLICATION: In training or a pre-event posture, locate the paper matrix-style approval label and use it to validate that a part number or numbers are CBRN protected.

It can also be used to verify the CBRN SCBA is assembled with the parts listed. If the part numbers on the respirator or on the label cannot be read or if there is any doubt that a part number is NIOSH-certified, consult NIOSH or the manufacturer before use.

For CBRN SCBA, the Department of Health and Human Services (DHHS) logo, the NIOSH logo, and a copy of the NIOSH CBRN Agent Approved Label are required to be on the official paper matrix style label.

All or some of the part number information on this CBRN paper approval label may not match the information on the backframe of the CBRN SCBA since the backframe label data is industrial approval data and would have existed before the CBRN approval was issued.

If you need to see what an example paper approval label looks like, refer to Figure 10, *NIOSH-certified CBRN SCBA matrix-style approval label, on the following page.*

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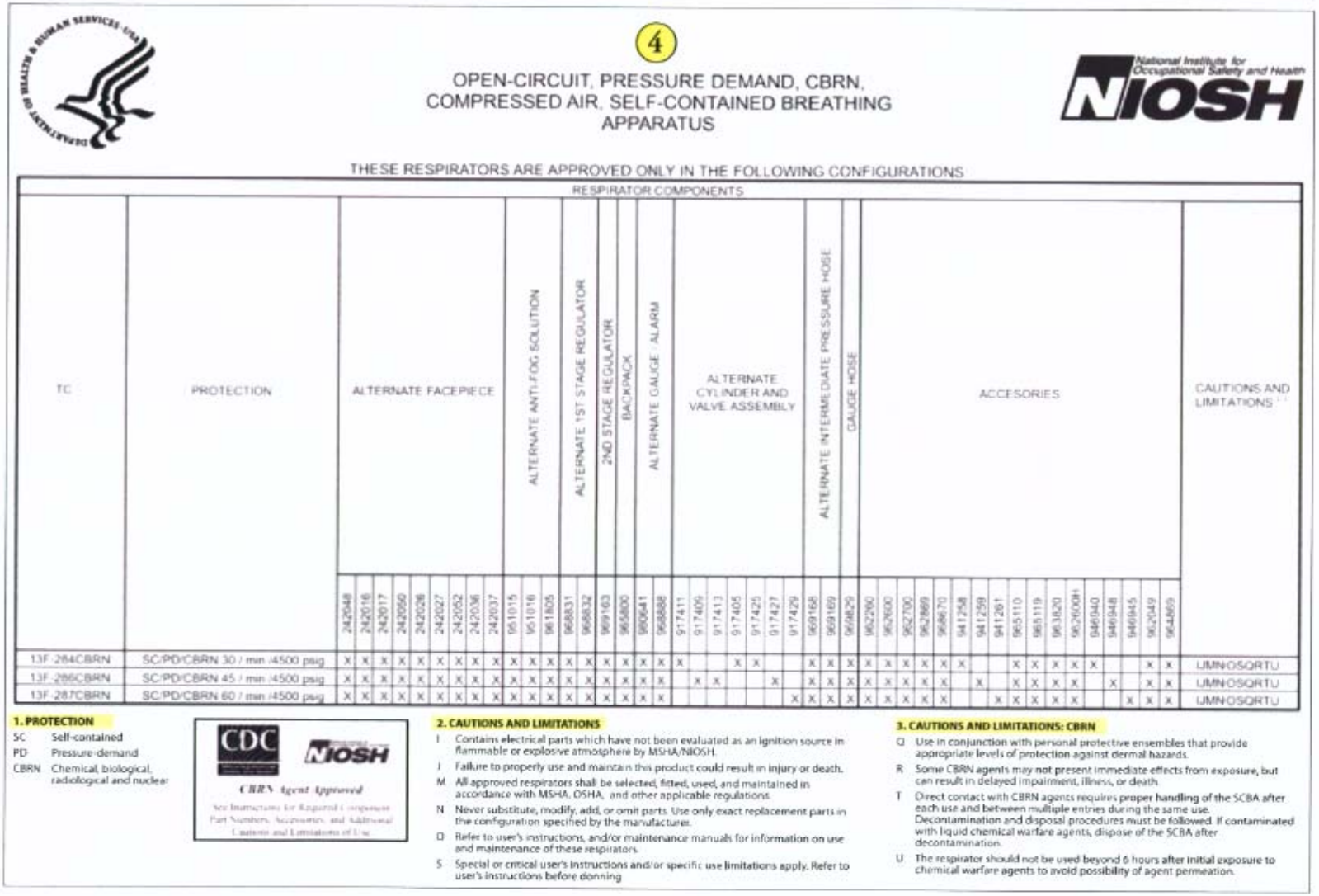

4

OPEN-CIRCUIT, PRESSURE DEMAND, CBRN, COMPRESSED AIR, SELF-CONTAINED BREATHING APPARATUS

National Institute for Occupational Safety and Health NIOSH

THESE RESPIRATORS ARE APPROVED ONLY IN THE FOLLOWING CONFIGURATIONS

TC	PROTECTION	RESPIRATOR COMPONENTS: ALTERNATE FACEPIECE									ALTERNATE ANTI-FOG SOLUTION			ALTERNATE 1ST STAGE REGULATOR		2ND STAGE REGULATOR BACKPACK		ALTERNATE GAUGE / ALARM		ALTERNATE CYLINDER AND VALVE ASSEMBLY								ALTERNATE INTERMEDIATE PRESSURE HOSE		GAUGE HOSE	ACCESORIES															CAUTIONS AND LIMITATIONS
		242048	242016	242017	242050	242026	242027	242052	242036	242037	951015	951016	961805	968831	968832	969163	965800	969041	968888	917411	917406	917413	917405	917425	917427	917429	969168	969169	969829	962960	962600	962700	962869	969670	941258	941259	941261	965110	965119	963820	962600H	946040	946948	946945	962049	964869	
13F-284CBRN	SC/PD/CBRN 30 / min /4500 psig	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X								X	X	X	X	X	X	X	X	X			X	X	X	X	X			X	X	UMNOSQRTU
13F-286CBRN	SC/PD/CBRN 45 / min /4500 psig	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X			X			X	X	X	X	X	X	X		X		X	X	X	X		X		X	X	UMNOSQRTU
13F-287CBRN	SC/PD/CBRN 60 / min /4500 psig	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X							X		X	X	X	X	X	X	X			X	X	X	X	X			X	X	X	UMNOSQRTU

1. PROTECTION

SC Self-contained
PD Pressure-demand
CBRN Chemical, biological, radiological and nuclear

CDC NIOSH
CBRN Agent Approved
See Instructions for Required Component Part Numbers, Accessories, and Additional Cautions and Limitations of Use

2. CAUTIONS AND LIMITATIONS

I Contains electrical parts which have not been evaluated as an ignition source in flammable or explosive atmosphere by MSHA/NIOSH.

J Failure to properly use and maintain this product could result in injury or death.

M All approved respirators shall be selected, fitted, used, and maintained in accordance with MSHA, OSHA, and other applicable regulations.

N Never substitute, modify, add, or omit parts. Use only exact replacement parts in the configuration specified by the manufacturer.

O Refer to user's instructions, and/or maintenance manuals for information on use and maintenance of these respirators.

S Special or critical user's instructions and/or specific use limitations apply. Refer to user's instructions before donning

3. CAUTIONS AND LIMITATIONS: CBRN

Q Use in conjunction with personal protective ensembles that provide appropriate levels of protection against dermal hazards.

R Some CBRN agents may not present immediate effects from exposure, but can result in delayed impairment, illness, or death.

T Direct contact with CBRN agents requires proper handling of the SCBA after each use and between multiple entries during the same use. Decontamination and disposal procedures must be followed. If contaminated with liquid chemical warfare agents, dispose of the SCBA after decontamination.

U The respirator should not be used beyond 6 hours after initial exposure to chemical warfare agents to avoid possibility of agent permeation.

Figure 11. NIOSH-certified CBRN SCBA matrix-style approval label 4.

Step 3 Know the Cautions and Limitations

RELEVANCE: When engineering controls, administrative procedures, or tactical elimination actions cannot render safe a workplace, the use of personal protective equipment is recommended, within the limitations of the responder, available equipment, and the site characterization methods.

LYNCHPIN: Repeative and realistic training are two keys to knowing your capabilities and acclimatizing to the equipment limitations.

MULTIPLIER: Access to manufacturer performance data of PPE under live agent/workplace conditions is also a responder multiplier and should be used in determining accurate risk assessments prior to entry, sustainment, and escape/rescue from CBRN hazards.

CONFIDENCE: Unknown CBRN concentration gradients and explosive hazards may be encountered and the highest level of respiratory, dermal, and ballistic protection is warranted. The user must be confident in existing response capabilities and have ideal PPE that contributes to mission accomplishment without distracting the user.

Be confident that the fit tested NIOSH-certified SCBA with CBRN protections provides the highest level of respiratory protection, within the use limitations of the NIOSH-approval and the unique response situations.

Description and History

NIOSH cautions and limitations are regulatory language relating to the use of respirators based on 25 years of respirator science, stakeholder feedback, workplace hazard evaluations and the use of respirators in the industrial workplace, firefighting, hazmat, and now CBRN defense and law enforcement responder disciplines.

They contain NIOSH-approved statements preceded by letter codes, specific to that caution or limitation statement. While they are required language, they can also serve as ideal training topics for responders. Cautions and limitations are at the bottom of the paper NIOSH matrix-style approval label (see Figure 11 in Step 2) in three sections:

Figure 12. CBRN incident characterization operations in a hazard zone transition lane. Each responder must be knowledgeable of the NIOSH cautions and limitations assigned to the respirator they are using, so knowledgeable that their actions are second nature when it comes to using the respirator in accordance with NIOSH and manufacturer's cautions and limitations. Notice the visible SCBA, the wet surfaces from facility decontamination sprays, and the 5 gallon buckets used to carry site assessment tools. Photograph is from NIOSH observations of the City of Pittsburgh, PA, full scale exercise evaluated by DHS, May, 2005.

Step 3 Know the Cautions and Limitations (Continued)

1. Protection. This section outlines the approved protection acronyms recognized by NIOSH in the formal approval letter.

Examples of protection words or phrases and their acronyms include: self-contained (SC), pressure demand (PD), and chemical, biological, radiological, and nuclear (CBRN).

These are protection ratings that define a type of protection or a level of protection.

A NIOSH Type refers to the protection against a type of contaminant such as a CBRN contaminant, a particulate contaminant or a toxic industrial chemical like chlorine.

A NIOSH Level refers to a level of protection such as a change in the type of facepiece or air supply capacity. Pressure Demand (PD) and Self-Contained (SC) are levels of respirator protection. CBRN SCBA are pressure demand, self-contained, full face, tight fitting, entry, and escape respirators.

2. Cautions and Limitations (C&L). Section 2 lists six C&L statements These are statements adopted from occupational and laboratory proven evaluations based on the industrial workplace. They apply to the SCBA when used at industrial sites, structural firefighting, or toxic industrial chemical hazardous material responses.

3. Cautions and Limitations: CBRN. Section 3 lists the four CBRN C&L. These are the new limitations that are mandatory for use in a CBRN response. Proper use of them will save you from being over-exposed, continually contaminated or fatally injured.

Training on the identified C&L, coupled with knowledge of jobsite hazards, experienced respirator decision logic, and respirator use life factors, afford workers a greater probability of not being exposed.

Even when personal protective equipment (PPE) may be contaminated, if the equipment performs as designed and the worker is trained, the worker can prevent exposure from contamination. However, currently there is not a fail safe protective posture that will last indefinitely, be reusable, and provide 100% protection for 100% of the time to 100% of the responders. CBRN SCBA are fit tested to fit the 95th percentile of the Los Alamos National Laboratory human anthropometric facial size distribution.

The generation of greater than immediately dangerous to life or health (IDLH), IDLH and "less than IDLH" values or other equivalent sampling and monitoring data can characterize the workplace. Then that data can contribute to respirator-use decision factors and logic for the employment of various types of NIOSH-certified respirators. If a site is uncharacterized, users should default to maximum protection afforded by the use of a NIOSH-certified SCBA with CBRN protections with appropriate dermal protection.

Step 3 Know the Cautions and Limitations (Continued)

Grounded in Science

Section 2 of the label contains the following six statements that rely on the fundamental NIOSH respirator certification program. for the industrial workplace. The six statements from Section 2 of the Cautions and Limitations are specific to SCBA respirators. Each statement has a letter indicator code followed by the mandatory Cautions and Limitations language. The highlighted keywords following each statement are user friendly translations of the official language.

"I" Contains electrical parts, which have not been evaluated as an ignition source in flammable or explosive atmospheres by MSHA/NIOSH.

Not Intrinsically Safe.

"J" Failure to properly use and maintain this product could result in injury or death.

Injury or Death from Misuse.

"M" All approved respirators shall be selected, fitted, used, and maintained in accordance with MSHA, OSHA, and other applicable regulations.

Observe OSHA Use Requirements

"N" Never substitute, modify, add, or omit parts. Use only exact replacement parts in the configuration specified by the manufacturer.

Parts are non-exchangeable. Do not intermix

"O" Refer to user's instructions (UI), and/or maintenance manuals for information on use and maintenance of these respirators.

Use and Maintain per the User's Instructions

"S" Special or critical UI and/or specific use limitations apply. Refer to UI before donning.

Other Information specific to type of use.

Figure 13. CBRN SCBA provide multipurpose utilization and can be used in traditional hazmat response, firefighting, clandestine lab interdiction, or CBRN incident response conditions. This photograph depicts technical decontamination station operations performed on a Level A responder wearing the yellow/green ensemble. Notice Level B responder with exposed SCBA, the yellow decontamination lane containment system, and walking cane assistance. Photograph taken May, 2005 during CBRN exercise, City of Pittsburgh, PA.

Step 4 Apply the CBRN Respirator In-Use Life (CRUL) with and without PPE

Hydrostatic Retesting and Torque of CBRN SCBA Cylinders

Of the many maintenance actions a SCBA technician must monitor and act on, hydrostatic requalification of the breathing air cylinder and proper torquing of the cylinder and neck valve assembly are of high importance.

On an annual basis CBRN SCBA require regulator flow tests, facepiece inspection and flow tests, and the installation of any manufacturer upgrades since the last annual inspection. In accordance with the cylinder manufacturer, hydrostatic retesting of SCBA cylinders is required in the USA every three or five years of the service life.

To verify that a used SCBA cylinder is compliant to the Department of Transportation (DOT) qualification or requalification/hydrostatic retesting requirements, the user or respiratory protection program manager must locate two sets of dates: the cylinder production date or the production date and the hydrostatic retest date.

CBRN SCBA are NIOSH-certified with composite cylinders. All-aluminum or steel cylinders are not currently approved to NIOSH-certified CBRN SCBA standards

If it is a new cylinder, the production date will be on the banded area of the cylinder. A sample image showing the banded area and an expired cylinder is located at Figure 14, Generic Composite Cylinder with DOT Exemption Label and Production Date of 10-93.

A used cylinder will have a hydrostatic retest date and it will be under a resin label. It is not required until the cylinder has been used a specific number of years past the production date.

In order to determine if a cylinder has expired, locate the cylinder manufacturer's original date of production on the cylinder and the type of material the cylinder is made out of. Once known, utilize the current calendar date to determine if the cylinder requires hydrostatic retesting or is compliant as the labels read.

If the current date you are inspecting the cylinder on is three to five years past the production date of the cylinder, then the cylinder requires hydrostatic retest.

You should now look for the hydrostatic test date stamp. If a retest date stamp is not found, do not use the cylinder and submit the cylinder for hydrostatic retest ASAP. Figure 15, Hydrostatic Retest Labels is an example of an SCBA cylinder with three hydrostatic retest labels under resin.

All SCBA users have the responsibility of verifying that the SCBA for use has a valid hydrostatic testing stamp, if the cylinder is not brand new.

Step 4 Apply the CBRN Respirator In Use Life (CRUL) with and without PPE(Continued)

USER RESPONSIBILITIES FOR HYDROSTATIC RETEST INSPECTION :

- Emergency responders in the field should perform the following:
- Conduct visual inspection of each cylinder before use. Always check for air leaks.
- Protect the cylinder neck valve stem, assembly, and handle.
- Locate and verify the required labels. If you are concerned that the cylinder has a missing or an expired hydrostatic retest stamp date, do the following steps:
  - Find the cylinder "manufactured date": (i.e. production date)
  - Determine what type of material the cylinder is made of/categorizing (i.e. steel, aluminum, fiberglass wrap or carbon composite with hoop wrapping or full-wrapping, etc.)
  - Utilize the manufacturer's specified hydrostatic test date intervals found in the UI. A carbon-fiber/composite wrapped cylinder is required to be hydrostatically tested every 3 years. However, select types of carbon fiber cylinders are required to be tested every 5 years. All carbon fiber cylinders currently have a 15-year service life/total use life span.

TECHNICIAN RESPONSIBILITIES FOR CYLINDER INSPECTION AND HYDROSTATIC COMPLIANCE:

Respiratory protection program managers or administrators have the responsibility of managing the respirator program and ensuring the overall safe use of all respirator equipment.

Supporting the managers are the trained technicians whose responsibility it is to perform the technical maintenance of the respirator system. Technicians are required to ensure that all SCBA are serviceable, safe, and maintained in accordance with the user's instructions and applicable recognized standards. Program administrators in the field should perform the following:

- Ensure all SCBA cylinders and supplied air cascade cylinders are hydrostatic re-tested in accordance with U.S. Department of Transportation (DOT) requirements and the cylinder manufacturer.
- Composite cylinder hydrostatic re-test completion dates are unique test date labels or codes under transparent hard resin. When a retest date is affixed on a cylinder, the retest station is certifying that the cylinder meets DOT compliance and that the retest station holds a valid identification number issued by the DOT.
  - The hydrostatic retest code consists of the month, a unique inspector mark (^), and the calendar year in two digits. For example, **7^05** which stands for July, ^ = retest station unique symbol, and 05. This means the test was passed in July, 2005. Three to five years from that date, depending on the type of composite cylinder, a new hydrostatic retest due date is required. Know and rotate the cylinder hydrostatic test due dates.
- Ensure the cylinder neck valves are tightened to specified torque foot lbs. per the SCBA manufacturer.
- Do not over tighten/over-torque the cylinder neck valve and assembly.

Step 4 Apply the CBRN Respirator In-Use Life (CRUL) with and without PPE(Continued)

Figure 14. Generic Composite Cylinder with DOT Exemption Label and Production Date of 10-93.

Figure 15. Hydrostatic Retest labels.

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Step 4 Apply the CBRN Respirator In-Use Life (CRUL) with and without PPE(Continued)

Respirator Terminology and "CBRN SCBA"

Is an SCBA a respirator or is it just an SCBA?

Current day SCBA manufacturing has most of its original development concepts from the workplaces of the underground mining industry, aircraft aviation, aeronautical engineering, and the underwater diving industry. With such diverse engineering input, the current day SCBA has progressed at a rapid pace to its current multiple purpose firefighting, law enforcement, and CBRN defense designs. It is expected to progress further with the introduction of new air-pressure boundaries and breathing zone designs using the SCBA platform as a common assembly. However, the distinction between an SCBA and a respirator (air-purifying respirator) is still not well defined. If this is not defined, accurate use of available respirator decision logic can be cumbersome to the user.

Currently, responders use several common terms to describe an SCBA.

Some are interchangeable terms such as breathing apparatus (BA) or "Air-Pak"®.

Most are just the first name of the respirator manufacturer or the manufacturer's name followed by "SCBA".

Conversely, the word "respirator" is understood to mean a negative pressure air-purifying respirator (APR) or a powered air-purifying respirator (PAPR), and considered completely separate from applied use like the SCBA.

Actually the SCBA is a respirator just like the closed circuit SCBA, the air-purifying respirator, the supplied air respirator, and the disposable half-mask all are respirators. They are just different classes/ categories according to NIOSH.

Per 42 CFR Part 84, paragraph 84.2, (aa), a respirator*[1] is defined as "any device designed to provide the wearer with respiratory protection against inhalation of a hazardous atmosphere."

Per NIOSH respirator selection/use logic dated 2004, both an SCBA and a air-purifying respirator/gas mask are respirators, just different classes of respirators.

With the introduction of NIOSH CBRN performance standards in 2001, the terms CBRN respirator, CBRN SCBA, CBRN APR, and CBRN PAPR are now commonly understood to represent a specific type of respirator that is approved to special CBRN performance standards per type of respirator---but none-the-less a respirator.

As discussed, any respirator has limitations. A CBRN SCBA has specific limitations, in addition to the traditional industrial and firefighting performance standards and limitations. These are defined limitations that require the user to know and understand.

Step 4 Apply the CBRN Respirator In-Use Life (CRUL) with and without PPE(Continued)

CAUTIONS AND LIMITATIONS: CBRN

Section 3 of the Cautions and Limitations contains four statements that rely on new NIOSH science based on repeatable chemical warfare agent testing conducted by the U.S. Army under contract to NIOSH.

Coupled with the Section 2 C&L, the more recent Section 3 Cautions and Limitations state the CBRN incident limitations of SCBA with CBRN protections.

Because of the integrated NFPA/NIOSH performance requirements, the user can effectively respond to structural fires, tactical law enforcement responses, or CBRN incidents with one type of SCBA—the multipurpose CBRN SCBA!

The following four statements are specific and universal to CBRN SCBA.

Each statement is preceded by an alphabetic letter code followed by the unique mandatory cautions and limitations language. The bolded keywords are provided as a concise reference for each official statement. CBRN technicians should be thoroughly familiar them:

Use with personal protective equipment.

"Q" "Use in conjunction with personal protective ensembles that provide appropriate levels of protection against (CBRN agent) dermal hazards."

Expect delayed effects.

"R" "Some CBRN agents may not present immediate effects from exposure, but can result in delayed impairment, illness, or death."

Handling is direct contact with any physical state of the CBRN agent. Decontaminate ASAP.

"T" "Direct contact with CBRN agents requires proper handling of the SCBA after each use and between multiple entries during the same use. Decontamination and disposal procedures must be followed. If contaminated with liquid chemical warfare agents, dispose of the SCBA after decontamination."

CBRN Respirator Use Life (CRUL) = 6 Hours.[2]**

"U" The respirator should not be used beyond six hours after initial exposure to chemical warfare agents to avoid possibility of continued agent permeation.

Note * [1]:
Respirator is defined in accordance with 42 CFR Part 84 and for the purposes of this guide, consists of the entire SCBA respirator; to include the facepiece/mask, harness assembly, regulators, high-pressure and low-pressure hose lines, cylinder, and all other authorized component or accessory, such as a cylinder cover, PASS device or hydration device.

Note ** [2]: Use beyond the six-hour mark in a chemical warfare environment is not suggested and further use could lead to increased risks in safety and health. For example, at the incident +5 mark (I+5) processing through the decontamination corridors should be initiated. After technical decontamination is complete, the user should safely doff the CBRN SCBA before the I+6 mark and the incident commander should ensure the CBRN SCBA hardware is properly contained and disposed in accordance with local standard operating procedures (SOP).

Step 4 Apply the CBRN Respirator In-Use Life (CRUL) with and without PPE (Continued)

Figure 16. Firefighter going on-air with a CBRN SCBA during a special fire academy training session.

Step 4 Apply the CBRN Respirator In-Use Life (CRUL) with and without PPE (Continued)

Recommendations for CBRN SCBA Use in Level A or B

CBRN SCBA versus non-CBRN SCBA. When SCBA are encapsulated by a protective ensemble, they are expected to assume the protective qualities of the suit material until that ensemble is ripped, compromised, or doffed.

If the suit is compromised, the human respiratory system is then highly susceptible to CBRN agent exposure.

A NIOSH-certified SCBA with CBRN protections will provide the greatest level of respiratory protection to the user, rather than a non-CBRN SCBA.

- The use of a **non-CBRN SCBA** in an OSHA/EPA Level A or Level B type suit should only be **used as a last resort** when CBRN SCBA are not available.
- Do not mix-or-match non-CBRN SCBA parts with CBRN protected parts.
- Use of a CBRN SCBA in an OSHA/EPA Level A or B protective ensemble/posture or NFPA-equivalent ensemble is highly recommended for any CBRN incident response.

TOPICS THAT REQUIRE IMMEDIATE TRAINING PRIOR TO CBRN RESPONSE.

1. USER SEAL CHECKS: Do a user seal check before going on-air. If respirator seal problems are detected during CBRN incident use, attempt to purge out contaminants via red purge valve, reseal, and request evacuation. Knowledge of odor threshold levels may be helpful in determining the type of chemical warfare agent release.
2. SEAL BREAKAGE: If evacuation/escape is immediate and the respirator facepiece seal breaks due to slippage, impact, or seal insert crimping, evacuate immediately. If you are delayed in escap ing attempt to purge out contaminants by use of the "by-pass valve" or "emergency airflow purge valve" for 3 seconds, and reseal immediately!
3. MAYDAY ACTIONS: If reseal techniques fail, announce "Mayday, Mayday, Mayday," and ensure your PASS device is activated. Open the by-pass valve halfway, attempt to locate the breakage, clear the respirator if possible, and conduct a user seal check by running your fingers over the exterior sealing surface to help ensure a uniform sealing interface exists between your face and the respirator. Protect your eyes by closing them during by-pass valve high pressure airflow. Contacts may dislodge or fold due to by-pass high pressure air.

Figure 17. Command and control directives, from a Level B responder (pointing), to a Level A responder in a CBRN hazard zone transition area. Hand and arm signals and eye contact play a significant communications role for encapsulated responders. If a secondary device ignites and disperses liquid SulfurMustard (HD) on the responders, the Level B responders have six hours before HD permeates the CBRN SCBA hardware. If the SCBA is not CBRN hardened, HD may cause catastrophic failure of the contaminated parts within minutes, as observed in NIOSH benchmarking tests performed by the U.S. Army RDECOM in 2001

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Step 4 Apply the CBRN Respirator In-Use Life (CRUL) with and without PPE (Continued)

TOPICS THAT REQUIRE IMMEDIATE TRAINING PRIOR TO CBRN RESPONSE (CONTINUED)

4. OVERPRESSURIZATION: If the responder is in Level B or an equivalent level of protective posture and in a confined space, do not rely on SCBA over-pressurization airflow for protection before, during, or after a CBRN incident. If cool air is felt on the face in a hazardous atmosphere and symptoms are self- or buddy-detected, assume that the respirator seal is broken. Administer first aid and declare Mayday alarm or man down alarm, clear the facepiece by purging and reseal as soon as possible.

5. FACEPIECE SEAL: If the responder is in Level B, never wear the head harness of a facepiece over the hooded section of a protective ensemble. The face-to-facepiece seal of the respirator sealing surfaces are adversely affected by any intrusion, especially from facial hair, hair buns, low hair lines, the protective hood or any type of "skull" cap head dressing.

6. DONNING TIME AND REGULATOR FUNCTION CHECK: In support of survival training, develop a CBRN SCBA donning time and function check standard and then practice them. Rely on the NFPA 60-second standard, but attain a seal on-air in less than 45 seconds, which leaves 15 seconds to don gloves. The minimum standard for donning the SCBA and going on-air should be in accordance with local standard operating procedures.

7. FIT TESTING: The respirator should be the last piece of PPE removed during the decontamination process. Inhalation is the primary route of exposure for CBRN agents and, thus, a properly fit tested and correctly donned respirator plays a critical role in protecting the responder's breath ing zone. Inhalation is considered the most severe route because there is not an immediate way to remove the contamination.

8. DECONTAMINATION: Because repeatable science demonstrates the caustic effects of persistent chemical warfare agents (CWA), such as GB and HD in liquid, aerosol and vapor states, contami nated responders should decontaminate as soon as possible. In NIOSH laboratories, GB and HD at defined concentrations have demonstrated penetration and permeation effects on the entire SCBA airflow-pressure boundary, regardless of the point of contamination on the SCBA.

9. CRUL: NIOSH recommends the establishment of a CBRN respirator in-use life (CRUL) program per class or respirator in your inventory. This program relies on the user knowing and applying the unique CBRN C&L of each respirator.

10. PASS DEVICE: Maximize the use of integrated and stand alone personal alert safety systems (PASS). Learn to read Heads-Up Displays on SCBA and integrate that knowledge with end-of-service life indicators from integrated PASS and redundant alarms.

SEL/AEL/MEL: A list of NIOSH-certified CBRN SCBA and NFPA-compliant protective ensembles is located on several internet sites, one being the NIOSH SEL webpage and the federal-civilian Inter-Agency Board for Equipment Standardization and Interoperability (IAB) Responder Knowledge Base (RKB): http://www.rkb.mipt.org/.

Step 4 Apply the CBRN Respirator In-Use Life (CRUL) with and without PPE (Continued)

CBRN Respirator in - Use Life (CRUL)

Definition: CRUL is an application concept that helps a user determine when the CBRN respirator hardware should be doffed to prevent possible exposure of the wearer.

It is intended to define a CBRN respirator's "in-use" service life (time limitations) based on NIOSH-approved cautions and limitations that incorporate actual time values.

Purpose: This CRUL concept is intended to provide the highest level of respiratory protection to the breathing zone of individual responders wearing serviceable and fit-tested CBRN respirators.

The limitation is determined from rigorous scientific analysis of the protective qualities of a respirator's engineered breathing zone. This analysis was based on laboratory standard test procedures (STP) using a respirator that is mechanically breathing on a static SMARTMAN headform in controlled conditions of GB and HD contamination.

RATIONALE: CRUL is linked to the Cautions and Limitations Statements

The concept of CRUL for a SCBA respirator with CBRN protections is based on the NIOSH caution and limitations statements "U" and "T."

These statements describe the NIOSH interpretation of a CBRN protection time limit related to user contamination or exposure to chemical warfare agents:

LIMITATION "U" SPECIFIES THE FOLLOWING VERBATIM:

"The respirator should not be used beyond six hours after initial exposure to chemical warfare agents to avoid possibility of agent permeation."

LIMITATION "T" SPECIFIES THE FOLLOWING EXTRACT:

"...If contaminated with liquid chemical warfare agents, dispose of the SCBA after decontamination."

CRUL Value for a CBRN SCBA is Six Hours

- Based on the above limitation statements, the CRUL value for a CBRN SCBA is six hours. This means that the CBRN SCBA hardware minus the cylinder, when contaminated with a chemical warfare agent (CWA) in aerosol or liquid form, has an in-use service life of six continuous hours, beginning at the time of contamination.
- Based on rigorous testing of the chemical warfare agents (GB and HD), and because GB (108 Angstroms in molecular size) and HD are currently considered the worst-case contaminants, biological or radiological particulate contamination is not expected to limit the in-use service life of a CBRN SCBA. The onset of chemical warfare agent (CWA) contamination is determined by using qualitative/quantitative sampling methods in the field and confirmed by follow-on laboratory analysis. The NIOSH chemical agent emergency response cards provide specific toxicology data and NIOSH recognized sampling methods:
  http://www.cdc.gov/niosh/topics/emres/chemagent.html.

Application: Actual field CRUL values may vary based on the hazardous concentration gradient encountered by the responder. However, the NIOSH laboratory CRUL value is the recommended maximum in-use time a specific type of CBRN respirator can be safely used after being potentially or actually contaminated with liquid chemical warfare agents. Vapor states of chemical warfare agents are of concern in confined spaces, however, in ambient air/open-air workplaces it is expected that the vapor states of chemical warfare agents will not be of tactical concern.

Step 4 Apply the CBRN Respirator In-Use Life (CRUL) with and without PPE (Continued)

Interpretation of CRUL to prevent Voiding a NIOSH-Approval.
Compliance with the following interpretation of NIOSH C&L is required in order to maintain NIOSH-approval for CBRN protections:

- **SIX-HOUR IN-USE LIFE**
  The in-use life time period is six continuous hours of use in a contaminated liquid chemical warfare environment or CWA aerosol/liquid/vapor confined-space environment. Intermittent or small time periods of use that are less than six hours, in contamination, count toward the total six hours of hardware use. Continued use or re-use is not recommended. The CBRN SCBA in-use life is not a sum of smaller time periods of intermittent use over any time frame such as eight or twelve hours. Use the CBRN SCBA in chemical warfare agent contamination for six hours and then dispose of it!

- **TIME LIMIT FOR DISPOSAL OF SCBA**
  A contaminated SCBA must be discarded within six hours after initial contact with any liquid chemical warfare agent, regardless of the duration or frequency of such contact. At the six-hour mark, the entire SCBA is initially decontaminated and disposed of properly, including the cylinder neck valve assembly. Air cylinder use durations, air resupply, and spare cylinder availability will dictate actual SCBA hardware disposal decision times within the six hour service life. The impact of vapor exposures is situation dependent and agent specific. Field/clinical medical tests and CDC specimen collection protocols applicable to contaminated responders are required. See the CDC link listed in Appendix D, References, for more information.

- **USE OF AIRLINE ACCESSORIES**
  Quick charge of a cylinder or buddy breathing in a CBRN environment is not recommended. Contingency stocks of spare CBRN cylinders and replacement CBRN SCBA are recommended. Rapid intervention teams (RIT) and search and rescue teams should use CBRN SCBA and CBRN APR.

- Examples of current NIOSH-certified respirators with CRUL values are SCBA; air-purifying respirators (APR); powered air-purifying respirators (PAPR), air-purifying escape respirators (APER) and self-contained escape respirators (SCER).

Figure 18. Litter evacuation of a training CBRN casualty from a sports venue. The responder in the center is in OSHA/EPA Level B protection. The other two responders are fire department EMS personnel and they are in OSHA/EPA Level C protection with CBRN APR. The yellow tape serves as a field expedient safeguard/seal enhancement measure between the respirator, glove, boot, and suit interfaces. This photograph was taken in May 2005, City of Pittsburgh, PA.

Step 5 Know the User's Instructions

The manufacturer's user's instructions* (UI) are included with every purchase of a new CBRN SCBA and typically include proprietary guidance on:

***Note:** also referred to as operations and maintenance manual.

1. Location of NIOSH labels, unique parts labeled "CBRN" by the manufacturer, CBRN cautions and limitations, and recommended training requirements
2. Description of respirator with pre-use, in-use, removal, and cold weather checks.
3. Donning and doffing in all conditions.
4. Fit testing, facial hair, and user seal check requirements.
5. Assembly and system warranty statements.
6. Air cylinder inspections, hydrostatic test requirements, and Grade D air specifications.
7. Legal and technical cautions, limitations, and warnings plus sanitization and decontamination/disposal guidance.
8. Maintenance inspection checklists.
9. Replacement parts.
10. Regulator function checks and free flow warnings due to underwater submersion.
11. Function of all end-of-service-time indicators (EOSTI) and rapid intervention team/university air connection system (RIT/UAC) connections.
12. Function of the heads-up display (HUD).
13. Inspection of hose integrity for damage and tight hose connections.
14. Function of personal alert safety system (PASS).
15. Function of air hatches, compact demand valves, or other specific SCBA air exchange designs related to facepiece regulator technology.
16. Air cylinder and cylinder neck valve assemblies supporting or not supporting interoperability of compatible SCBA breathing air cylinders and backframes.
17. Accessories that may increase the ballistic protection of components.
18. Conduct of a user seal check without inadvertently applying excessive hand pressure and thus creating a false respirator sealing surface or condition.

Figure 19. Team leader conducting user seal check. Photo courtesy of Terrence K. Cloonan, NPPTL/NIOSH and Mr. Leslie Murphy, United States Capitol Police (USCP), Washington, DC, January 2006

Note: See Appendix A, Primary Component Assemblies, Appendix B, Component Diagram – Non-Detachable Regulator, and Appendix C, Component Diagram – Detachable Regulator, for generic terminology that identifies common components of a CBRN SCBA.

Step 6 Know the Facepiece Indicators of Concern

The facepiece may be donned incorrectly if:

A. The facepiece is fogged over and you are "on-air."

USER CORRECTIONS:

1) If you are in a *hazardous area*, escape immediately.

2) If you are in a *clean area*:

Remove (doff) the facepiece and re-don it.

If the user is wearing an ensemble, ensure the suit hood is over top of the respirator head harness and not underneath the head harness. Use anti-fog solution in advance to keep the facepiece from fogging up.

3) Check that the air cylinder valve is fully turned on.

4) If there is low pressure in cylinder, seek recharged or new fully charged breathing air cylinder.

5) If fogging continues while on-air, doff in a clean area. Evaluate the proper fit or hairline infractions, and other factors related to make, model, or comfort traits of the respirator.

6) Re-don the facepiece to verify that it seals correctly.

7) If fogging continues while on-air, reevaluate the situation.

Figure 20. Generic drawing of a NIOSH-certified SCBA with CBRN protections showing the distinct components of the respirator. This SCBA CBRN uses a mask-mounted regulator that is located by the red purge valve. The drawing is modeled after an MSA CBRN SCBA, 2006.

Step 6 Know the Facepiece Indicators of Concern (Continued)

B. The second-stage regulator or air hatch/switch will not operate correctly or mate properly with the facepiece.

CONTAMINATED ATMOSPHERE:

8) If the second stage regulator fails in a *contaminated* atmosphere, activate PASS device, turn the by-pass valve on for short blasts of air and escape.

CLEAN ATMOSPHERE CORRECTIONS:

- Disconnect the regulator and then reconnect it per manufacturer's instructions OR manually open and close the air hatch/switch.

Note: NIOSH recognizes that Sarin (GB) and Sulfur Mustard (HD) permeate silicone material surfaces at a faster rate than other similar material surfaces; therefore, do **not** alter the airflow pathways or materials.

- Check that the facepiece matches the make and model of the regulator. Use the NIOSH matrix-style approval label to confirm compatible part numbers
- Ensure locking mechanisms are fully seated, not broken, and debris free. Re-don.

C. Heads-up display (HUD) is not working or you cannot see the HUD:

USER CORRECTIONS:

- Doff. Inspect the HUD for damage. Use in accordance with the manufacturer's user's instructions while donned.
- Ensure the batteries are serviceable. Know battery life and replace depleted ones.
- Ensure the connections of the HUD are clean. Reconnect the second-stage regulator to the face-piece and ensure it is correctly attached. Re-don.

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Step 7 Implement Decontamination Methods

Decontaminate as soon as possible.

Whenever conditions permit during an emergency event, responders must decontaminate *as soon as possible!*

BE PREPARED BEFORE AN EMERGENCY EVENT OCCURS:

- Know the existing decontamination plan of the municipality.
- Keep in mind that the SCBA CRUL six-hour in-use life includes the time required to conduct the decontamination process (decon).
- The time required for disposal of a CBRN SCBA is not included in CRUL.
- Refer to NIOSH cautions and limitations "T" for handling and decontamination guidance.

KNOW WHAT TO DO *DURING* AN EMERGENCY EVENT:

If known or suspected CBRN contamination is present on the SCBA and other PPE:

- **Keep respirator facepiece on.** Do not remove contaminated (or suspected of being contaminated) respirator facepiece during the decontamination process until instructed by a qualified responder.

Figure 21. Firefighters conducting gross decontamination training using a low- pressure, high volume fog nozzle master stream in the warm zone decontamination corridor. Hot zone is to the left of the photograph. Firefighters are wearing traditional turnout gear and SCBA respirators. City of Pittsburgh, PA, CBRN exercise, 2005.

- **Implement decontamination methods.** As the emergency situation permits, conduct emergency or gross wet or dry decon, followed by technical decon, using all available methods. The current primary method is the use of available fire department equipment to conduct ladder pipe/truck decon of CBRN casualties and responders. Other field-expedient operations exist; however, all these methods currently use high-volume, low-pressure, clean tepid water to reduce surface CBRN contamination permeation and off-gassing.
- **Administer consecutive water applications.** Per the CDC, responders should conduct three separate consecutive water applications per station. Utilize 5% common bleach solution as a supplemental decontamination solution.
- **Exercise prevention methods against CBRN toxicity.** Determine run-off wash contamination toxicity, and implement local prevention measures to preserve and protect responders, the public, municipal infrastructure, and the environment from the anticipated or known effects of CBRN run-off waste products. Certain chemical warfare agents may not be neutralized, and others may be hydrolyzed or diluted while being physically washed off equipment surfaces.

Step 7 Review Decontamination Methods (Continued)

KNOW WHAT TO DO AFTER AN EMERGENCY EVENT:

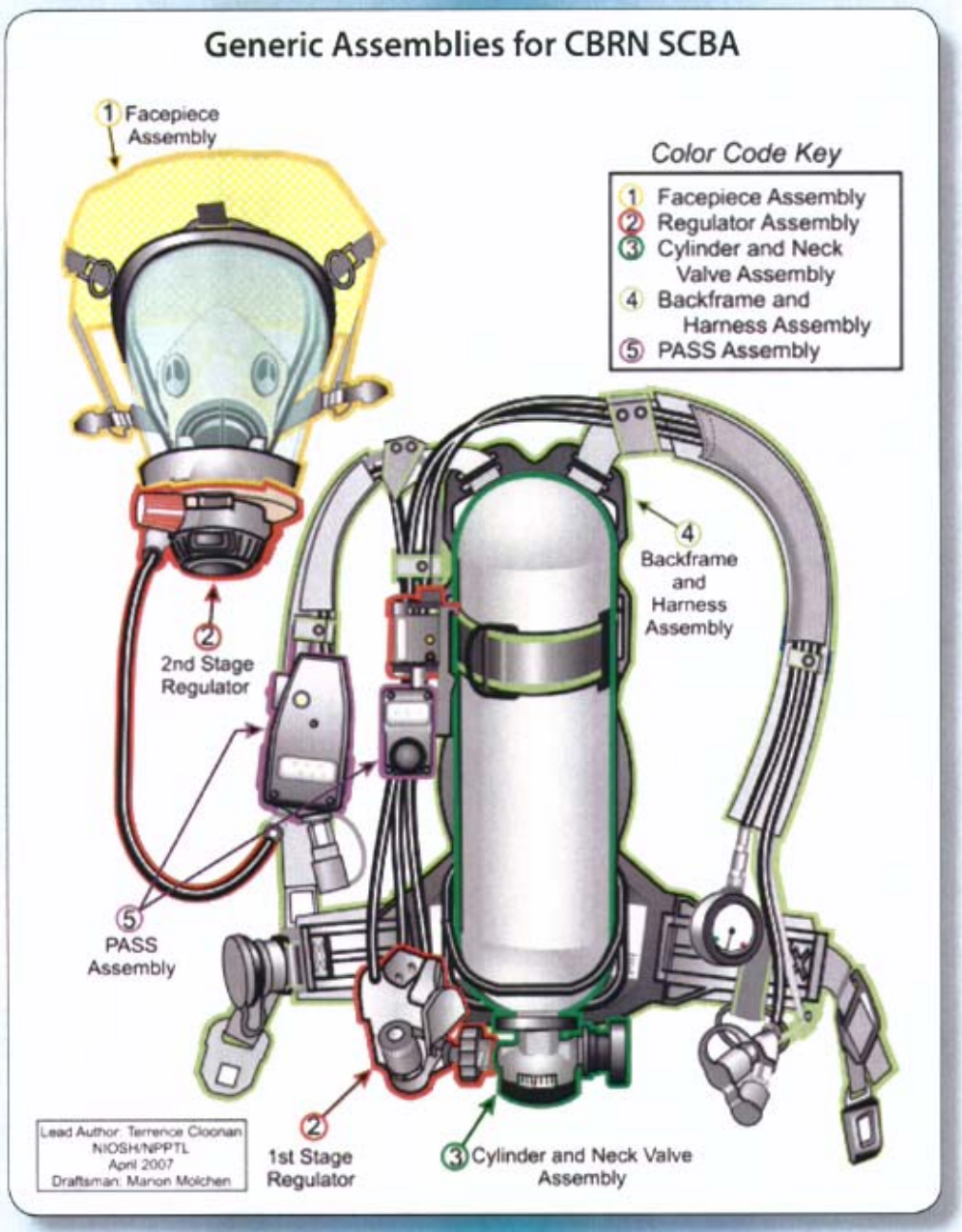
- Use specific mitigation measures. Contamination avoidance, sampling, monitoring, mitigation, and decontamination practices should be planned and trained in advance.
  - Control lines - Use vapor and liquid contamination control lines to delineate hazard zones in accordance with the prevailing wind direction and ambient temperature. Ground surface winds may vary from metrological weather data.
  - Contaminated SCBA - Users should ensure that known or potentially contaminated CBRN SCBA (or non-CBRN SCBA) are double-bagged in plastic, labeled with the type of contamination, the amount and type of decontamination solution used, and the technique used to conduct gross and technical decontamination.
  - CBRN Respirator Use Life (CRUL) - The contamination start time for SCBA and the amount and type of CBRN contamination are important factors relative to CRUL start time accuracy, and disposal timeline management.
  - Sampling and monitoring - Repeatable and quantifiable CBRN agent sampling and detection methods are required. Accurate detection of CBRN agents on SCBA is incident dependent and subject to the consensus findings of qualified technicians that use recognized quantitative CBRN agent sampling and detection methods and analysis, generate repeatable data, exercise controlled sample custody, and provide conclusive agent identification results to the incident commander or lead federal agency regarding disposal actions.
  - Methods - A decontamination method, specific to the type of CBRN agent contamination, may contribute to the increased efficacy of the decontamination process. Users should seek specific guidance regarding decontamination and disposal procedures for specific types of contamination from the local incident commander, state public health department, lead federal agency, or respirator manufacturer. For more information on the best practice decontamination process for Sarin (GB), visit the CDC link at: http://www.bt.cdc.gov/agent/sarin/erc107-44-8pr.asp. Or for Sulfur Mustard (HD), visit the CDC link at: http://www.bt.cdc.gov/agent/sulfurmustard/erc505-60-2pr.asp.

Information resources describing basic decontamination processes are the American Industrial Hygiene Association (AIHA) Guideline 6-2005, Guideline for the Decontamination of Chemical Protective Clothing and Equipment, the NIOSH/OSHA/USCG/EPA OS&H Guidance Manual for Hazardous Waste Site Activities and the OSHA/NIOSH CBRN PPE matrix at http://www.osha.gov/SLTC/emergencypreparedness/cbrnmatrix/index.html.

Appendix A1:
Primary Component Assemblies

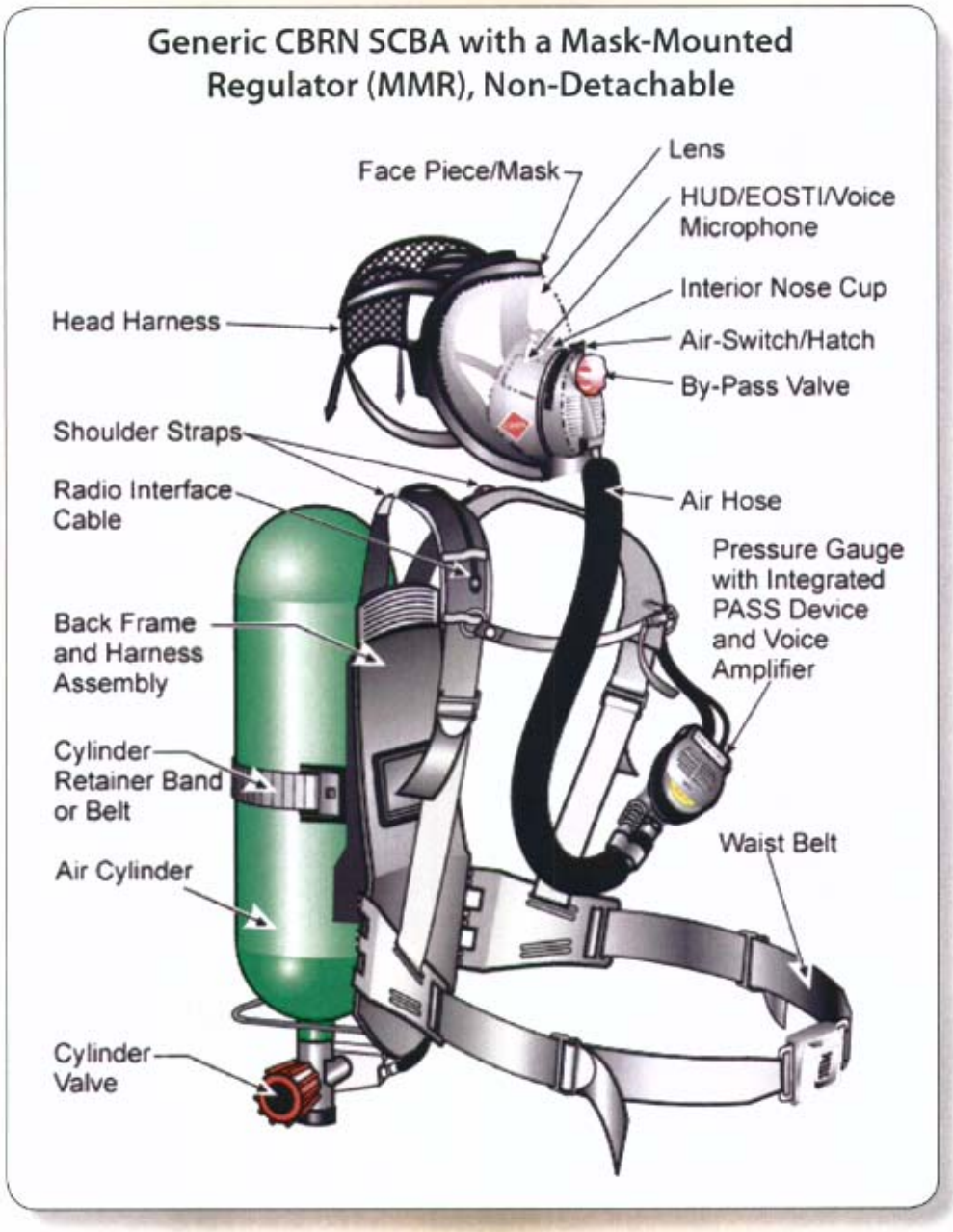
30-minute duration cylinder with CBRN protected hardware showing distinct color codes that identify the traditional four types of assemblies plus the addition of a fifth assembly, the PASS assembly. Generic drawing adapted from actual Survivair/Bacou-Dalloz CBRN SCBA, April 4, 2007.

Appendix A2:
Primary Component Assemblies



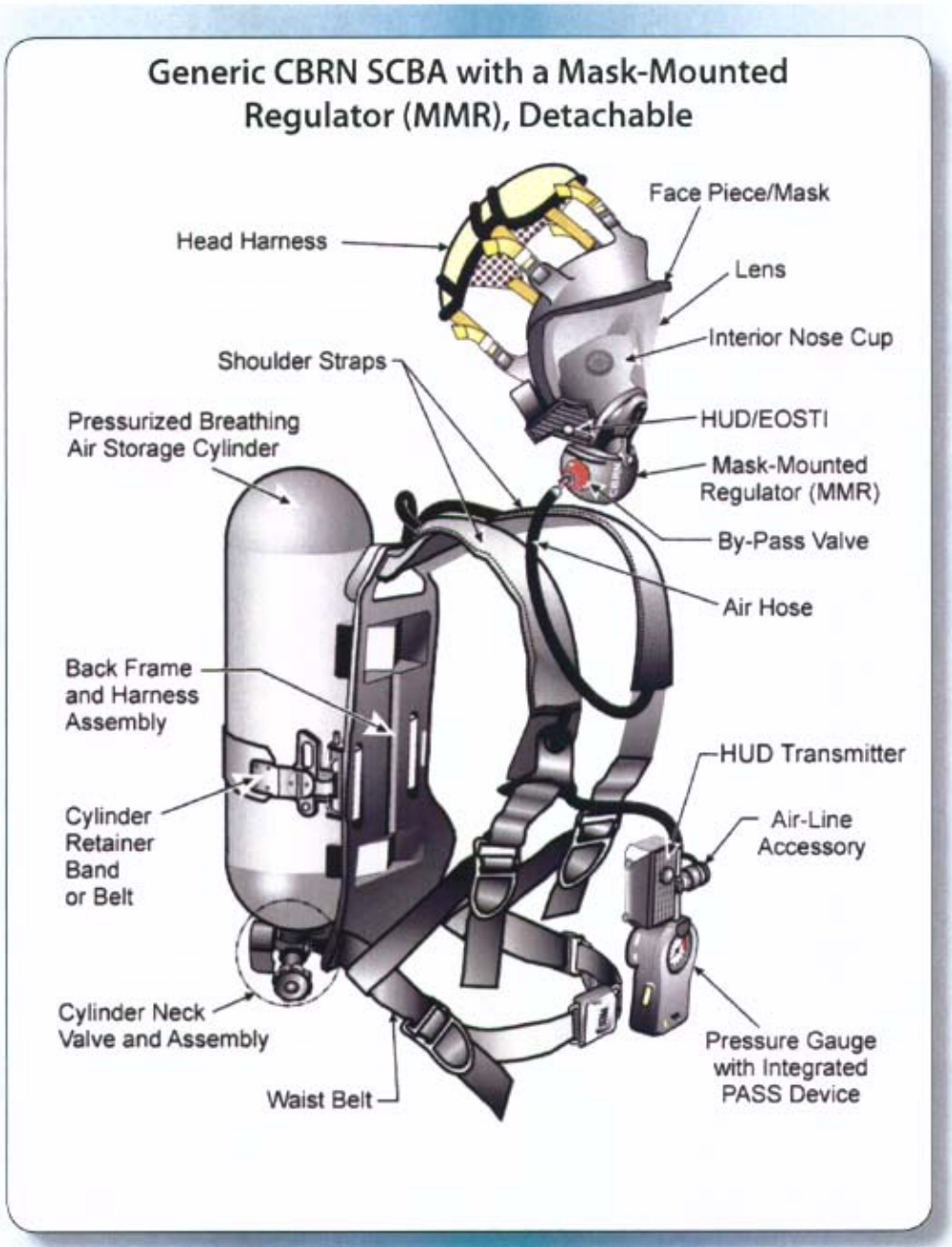
Dual-dimensional view of respirator showing front view of facepiece and rear view of SCBA hardware. Five primary component assemblies are color coded and outlined for ease of identification. Drawing adapted from a Survivair CBRN SCBA, March, 2007.

Appendix B: Component Diagram Non-Detachable Regulator



Front right view of CBRN SCBA with 16 sub-assembly components named and called out. Generic drawing is adapted from International Safety Instruments, Inc. (ISI) CBRN SCBA, August, 2006.

Appendix C: Component Diagram SCBA with Detachable Regulator



Front right view of respirator identifying seventeen distinct sub-assemblies that make up the five primary component assemblies. RIT/UAC and 1st Stage regulator are not shown but are opposite of the circled cylinder neck valve assembly. Generic drawing adapted from Mine Safety Appliances Co. (MSA) CBRN SCBA, August, 2006.

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Notes:

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Back cover photography.

Frontal concealed law enforcement sniper team in Level B protection providing security during a CBRN-barricaded suspect apprehension training exercise. The SCBA cylinders are in rip-stop cloth concealment only shrouds and separate from the ballistic vest. May 2005 Fort Collins Police Department SWAT, Fort Collins, Colorado.

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